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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/087,360	03/01/2002	Sang K. Cha	1907	3325

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EXAMINER	
DANG, THANH HA T	

ART UNIT	PAPER NUMBER
2163	

DATE MAILED: 10/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/087,360	CHA ET AL.	
	Examiner	Art Unit	
	Thanh-Ha Dang	2163	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) *17-32* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 March 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Elected Claims 1-16 are rejected in this Office Action.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claim 1 recites the limitation "... the cache behavior ..." in the preamble. There is insufficient antecedent basis for this limitation in the claim.

Claim 12 recites the limitation "... the cache behavior ..." in the preamble. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1 and 12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 1 recites a method of improving the cache behavior comprising the steps of "associating with each node ... node"; "representing ... MBR"; and "compressing ... quantization". The steps are broadly recited without regard to any tangible way of implementing them that they are directed to the abstract

idea. The abstract idea comprising the steps are not instantiated into some specific physical implementation which would result in a practical application producing a concrete, useful, and tangible result to form the basis of statutory subject matter under 35 U.S.C. 101.

Claim 12 recites a of improving the cache behavior comprising the steps of "associating with each node ... node"; "representing ... shape"; and "compressing ... quantization". The steps are broadly recited without regard to any tangible way of implementing them that they are directed to the abstract idea. The abstract idea comprising the steps are not instantiated into some specific physical implementation which would result in a practical application producing a concrete, useful, and tangible result to form the basis of statutory subject matter under 35 U.S.C. 101.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 6-9, and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,470,344 issued to Kothuri et al. ("Kothrui").

As to **Claim 1**, Kothuri teaches "a method of improving the cache behavior of accessing a multidimensional index structure resident in main memory for facilitating reference to data objects stored in a database, where the index structure consists of internal nodes having pointers to child nodes and leaf nodes having to database objects, the method comprising the steps of:

- associating with each node a minimum bounding rectangle ("MBR"), wherein each MBR is the minimal hyper-rectangle enclosing the corresponding data object in the case of a leaf node and all the hyper-rectangles in the child node in the case of an internal node" (Figures 1A and 7 illustrate associating with each node a minimum bounding rectangle, column 9, lines 1-21);
- Kothuri teaches "representing each of one or more said MBRs by a relative representation of an MBR ("RMBR") that is the coordinates of the MBR represented relative to the coordinates of a reference MBR" (Figures 3 and 6A display the relative representation of a minimum bounding rectangle, column 11, lines 47-53); and
- "compressing each RMBRs into a quantized, RMBR ("QRMBR") by quantizing each RMBR to finite precision by cutting off trailing insignificant bits after quantization" (column 11, lines 60-67 and column 12, lines 1-62 wherein illustrates an equivalent process of cutting off trailing insignificant bits after quantization using truncate or rounded down procedure).

As to **Claim 2**, Kothuri teaches "wherein said multi-dimensional index structure is an R-tree" (Figure 4, illustrates the R-tree, column 12, lines 55-56).

As to **Claim 6**, Kothuri teaches "wherein each internal node has a plurality of entries where the first entry has a QRMBR and a pointer while the rest of the entries have only QRMBRs" (column 12, lines 49-54).

As to **Claim 7**, Kothuri teaches "wherein each node stores a reference MBR" (Figures 1A and 1B illustrate each node stores a reference MBR).

As to **Claim 8**, Kothuri teaches "wherein the reference MBR of a node is obtained from the corresponding QRMBR stored in the node's parent node" (column 12, lines 49-54).

As to **Claim 9**, Kothuri teaches "wherein the internal nodes store QRMBRs while the leaf nodes store MBRs" (column 9, lines 10-21).

As to **Claim 11**, Kothuri teaches "wherein said database resides in disk" (column 6, lines 14-16).

Claims 12-14 and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,470,344 issued to Kothuri et al. ("Kothrui").

As to **Claim 12**, Kothuri teaches "a method of improving the cache behavior of accessing a multidimensional index structure resident in main memory for facilitating reference to data objects stored in a database, where the index structure consists of internal nodes having pointers to child nodes and leaf nodes having to database objects, the method comprising the steps of:

- associating with each node a minimum bounding shape, a multi-dimensional shape enclosing the corresponding data object in the case of a leaf node and all the minimum bounding shapes in the child node in the case of an internal node" (Figure 1, column 8, lines 19-39);
- "representing each of one or more said minimum bounding shape by a relative representation that is the coordinates of the minimum bounding shape represented relative to the coordinates of a reference minimum bounding shape" (Figures 3 and 6A display the relative representation of a minimum bounding shape wherein the shape is equivalent to the illustrated rectangle, column 11, lines 47-53); and
- "compressing each relative representation into a quantized representation by quantizing each relative representation to finite precision by cutting off trailing insignificant bits after quantization" (column 11, lines 60-67 and column 12, lines 1-62 wherein illustrates an equivalent process of cutting off trailing insignificant bits after quantization using truncate or rounded down procedure).

As to **Claim 13**, Kothuri teaches "wherein each internal node has a plurality of entries where the first entry has a quantized representation and a pointer while the rest of the entries have only quantized representations" (column 12, lines 49-54).

As to **Claim 14**, Kothuri teaches "wherein the reference minimum bounding shape of a node is obtained from the corresponding quantized representation stored in the node's parent node" (column 12, lines 49-54).

As to **Claim 16**, Kothuri teaches "wherein said database resides in disk" (column 6, lines 14-16).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,470,344 issued to Kothuri et al. ("Kothrui") as applied to claim 1 above, and further in view of U.S. Patent No. 6,868,410 issued to Fortin et al. ("Fortin").

As to **Claim 3**:

Kothuri teaches the elements of Claim 1 as stated above.

Kothuri does not explicitly teach "wherein said multi-dimensional index structure is an R*-tree".

Fortin teaches "wherein said multi-dimensional index structure is an R*-tree" (column 8, lines 31-65).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the teaching of Fortin with the teaching of Kothuri in order to provide a method or system which integrates multi-dimensional index structure such as an R*-tree, thereby providing a method or system which further improved storage or memory utilization and robustness in processing data distribution.

As to **Claim 4**:

Kothuri teaches the elements of Claim 1 as stated above.

Kothuri does not explicitly teach "wherein said multi-dimensional index structure is an R+-tree".

Fortin teaches "wherein said multi-dimensional index structure is an R+-tree" (column 8, lines 31-65).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the teaching of Fortin with the teaching of Kothuri in order to provide a method or system which integrates multi-dimensional index structure such as an R+-tree, thereby providing a method or system which further reduced overlap of minimum bounding rectangles.

As to **Claim 5**:

Kothuri teaches the elements of Claim 1 as stated above.

Kothuri does not explicitly teach "wherein said multi-dimensional index structure is a Hilbert R-tree".

Fortin teaches "wherein said multi-dimensional index structure is a Hilbert R-tree" (column 8, lines 31-65).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the teaching of Fortin with the teaching of Kothuri in order to provide a method or system which integrates multi-dimensional index structure such as a Hilbert R-tree, thereby providing a method or system which further improved storage or memory utilization.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,470,344 issued to Kothuri et al. ("Kothrui") as applied to claim 1 above, and further in view of "Compacting Discriminator Information for Spatial Trees by Inga Sitzmann and Peter J. Stuckey, Copyright 2001, Australian Computer Society, Inc.

As to **Claim 10**:

Kothuri teaches the elements of Claim 1 as stated above.

Kothuri does not explicitly teach "wherein said database resides in main memory".

Sitzmann and Stuckey teach "wherein said database resides in main memory" (Abstract, page 167).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the teachings of Sitzmann and Stuckey with the teaching of Kothuri in order to provide a method or system wherein database will fit entirely in main memory (Sitzmann and Stuckey, Introduction).

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,470,344 issued to Kothuri et al. ("Kothrui") as applied to claim 12 above, and further in view of "Compacting Discriminator Information for Spatial Trees by Inga Sitzmann and Peter J. Stuckey, Copyright 2001, Australian Computer Society, Inc.

As to **Claim 15**:

Kothuri teaches the elements of Claim 12 as stated above.

Kothuri does not explicitly teach "wherein said database resides in main memory".

Sitzmann and Stuckey teach "wherein said database resides in main memory" (Abstract, page 167).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the teachings of Sitzmann and Stuckey with the teaching of Kothuri in order to provide a method or system wherein database will fit entirely in main memory (Sitzmann and Stuckey, Introduction).

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Ha Dang whose telephone number is 571-272-4033. The examiner can normally be reached on Monday-Friday from 9:00 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Safet Metjahic can be reached on 571-272-4023. The fax phone number for the organization where this application or proceeding is assigned is 571-273-4033.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thanh-Ha Dang
Examiner
Art Unit 2163